A NEW SPECIES OF *CICINDELA* LINNAEUS (COLEOPTERA: CICINDELIDAE) FROM FLORIDA, AND ELEVATION OF *C. ABDOMINALIS SCABROSA* SCHAUPP TO SPECIES LEVEL[1]

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ABSTRACT: A new species of *Cicindela* Linnaeus was discovered during a study of the named forms of *C. abdominalis* Fabricius. This species, *C. highlandensis* n. sp., is described here. Additionally, the various names applied to *C. abdominalis* are examined for validity. *C. abdominalis* is redescribed. Based on examination of types, the following name changes are proposed. *C. scabrosa* Schaupp is found to be a valid species. *C. extenuata* Casey is a synonym of *C. scabrosa* Schaupp, as is *C. abdominalis floridana* Cartwright (NEW SYNONYMY). *C. faceta* Casey is a synonym of *C. abdominalis* F. (NEW SYNONYMY).

C. highlandensis n. sp. is believed to be a sister species of *C. abdominalis*, having evolved on pre-Pleistocene islands in central Florida.

This research began several years ago during a cursory study of the tiger beetle fauna of Florida. An attempt at collecting and identifying the named forms of this group revealed inconsistencies concerning the application of names to *Cicindela abdominalis* and its subspecies *scabrosa.*

Several museum collections that were borrowed had mixtures of the various forms under the same heading, some examples merely set aside with question marks. Invariably it was found that the confused specimens were *scabrosa.*

Cicindela abdominalis Fabricius has included 3 subspecies; *abdominalis, scabrosa* Schaupp, and *floridana* Cartwright. Additionally, Casey (1913) described *C. extenuata* and *C. faceta* as species close to *abdominalis.* Newman (1838) described *C. ventralis* from St. John's Bluff, Florida, but his description is too incomplete to be interpreted. The name must therefore remain a *nomen inquirendum.*

The genus *Cicindela* (*sensu latu*) still requires comprehensive study in North America. Numerous subspecies names have yet to be resolved. Species descriptions, however, have been relatively few in recent years. It is surprising, therefore, to discover a new species in Florida. The following descriptions and discussions are presented to make a species name available for a manuscript dealing with the phylogeny, zoogeography, and ecology of *Cicindela abdominalis* Fabricius and its related species. Detailed discussion of the relationships of this new species is postponed to publication of the above mentioned manuscript.

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***Cicindela highlandensis* n. sp.**

Head: Eyes prominent, approximately as wide as humerus, wider than pronotum. Clypeus black with purple, green, and blue reflection; microsculpture isodiametric. Labrum pale, medially convex with 2 anterior medial setae, 2 lateral setae; slightly wider than long; front margin with central protuberance, edentate; microsculpture isodiametric laterally, effaced or stretched on median convexity. Mandibles pale basally, apical half piceus. Mentum with acute median tooth. Ligula lacking. Maxilla cardo with 2 setae, stipes with 5 setae; segment 1 with 1 apical seta, segment 2 glabrous, segment 3 with 2-3 setae, segment 4 with 2 apical setae, segment 5 glabrous. Labial palp 4 segmented; segments 1 and 2 rufous, glabrous; segment 3 rufous, glabrous ventrally, with 15-18 scattered erect setae dorsally; segment 4 piceus, glabrous. Gena glabrous, bright purple with 8 longitudinally impressed striae terminating anteriorly in a depressed pit under anterior margin of eye; microsculpture effaced medially, isodiametric towards ventral margin. Frons glabrous, longitudinally strigose; laterally purple; medially green; microsculpture isodiametric medially, stretched laterally. Inner margin of eye emarginate; elevated interocular area of head smooth near lateral edge, longitudinally grooved in center of head; 2 supraorbital setae. Antennae with segments 1-4 glabrous except for scattered erect setae, rufous with green reflection; segment 1 with 1 apical seta; segment 2 glabrous; segment 3 with 3 evenly spaced medial setae, several apical setae; segment 4 with 1 medial seta, 2 apical setae; segment 1 slightly swollen apically, 2-3 times length of segment 2; segment 3 equal in length to segments 2 + 4; segments 5-11 covered with short dense pubescence.

Thorax: Pronotum with deeply impressed anterior V-shaped impression; longitudinal median line with impressed transverse strigae; microsculpture isodiametric, tending toward meshes anteriorly and laterally; basal impression deep; posterior angle on elevated bump; surface green with cupreus-purple mixture; lateral margin glabrous. Prosternum glabrous, shining purple. Proepisternum smooth, glabrous, shining purple, microsculpture effaced. Procoxae with small cluster of white setae on inner and lateral margin, glabrous medially; inner surface with single erect seta. Trochanter glabrous. Profemur metallic purple on basal half, rufous apically; 3 erect setae on venter. Protibia rufous with purple reflection; inner surface of apical half covered with dense fringe of short hairs; anterior surface with 6 large erect setae set in green foveae. Protarsi glabrous dorsally; ventrally with 4 pair of erect setae; segment 1 longest, 2-5 subequal. Claws 2, long, smooth. Protarsal segments 1-4 ventrally at apex with 2 larger setae. Mesosternum glabrous. Mesepisternum glabrous, shiny, purple. Mesocoxae setose on anterior lateral surface; glabrous medially on inner surface; posteriorly with a few hairs and a single, fine, erect, seta. Trochanter glabrous. Mesofemur glabrous ventrally. Mesotibia with dense inner fringe of hairs in apical half. Meta sternum glabrous. Metepisternum glabrous. Metacoxae with single erect seta each on anterior and median portion, posterior lateral edge with 3-4 decumbent setae. Trochanter glabrous. Metatibia with short fringe of setae at apex on inner margin. Metafemur with 5 ventral setae. Elytron black; scutellum transversely impressed, with slight purple-green reflection; 7-9 irregular sutural foveae containing a seta set in shallow pit, pit with slight metallic purple reflection. Entire dorsal surface appearing shallowly punctate; microsculpture coarse, isodimetric. Suture terminating posteriorly in spine. Apices microserrulate. Depressed area near humerus with 6 setae.

Abdomen: Rufous, glabrous except for erect tactile setae along posterior margin of apical sternite, and medially on sternites 3-4. Sternite 5 depressed medially with numerous small hairs in depression.

Size: Holotype female: 11.5 mm. in length (Fig. 1).

Variation: (35 measured) Females average 11.4 mm. in length (10.5-12.0); 35 males average 10.9 mm. in length (10.5-12.0). Males have protarsal segments 1-3 dilated with

ventral pad of dense setae. Approximately half of the specimens were immaculate. The only maculation seen was a very narrow apical lunule. Neither ventral pubescence nor pronotal lateral hairs occurred on any specimens.

Type Locality: Florida; Highlands Co., Rt. 27, 0.25 mi. south of Josephine Creek, 4.3 mi. north of junction of Rt. S-17 and 621; 10-VII-1976, P.M. Choate & L. Davis, 23 paratypes (15 males, 8 females).

Distribution: Restricted to Highlands Co., FL., on fossil sand dunes south of Sebring. This sand ridge extends into Polk County, thus this species may also occur there.

Etymology: This new species is named for Highlands Co., FL., an area noted for its plant and animal endemics.

Specimens examined: Holotype and 101 paratypes, all from Highlands Co., FL. All but 5 specimens were from the type locality. 30 specimens were collected in June (some teneral) and 71 in July. The 5 specimens not from the type locality are in FSCA (Florida State Collection of Arthropods, Gainesvile, FL, 32602), and bear the data "Hendricks Field, nr. Sebring, on fossil sand dunes," 5 - VII - 1976, H.V. Weems, collr..

Type material will be distributed as follows: Holotype and 9 paratypes from the original series will be deposited in FSCA. Additional specimens (4 ea.) from the same series will be sent to AMNH (New York), USNM, CAS (California Academy of Sciences), MCZ Harvard University), Strickland Museum (Edmonton, Alberta), Carnegie Museum (Pittsburgh), with the remainder in the author's personal collection.

Redescription of *Cicindela abdominalis* Fabricius

Cicindela abdominalis Fabricius, 1801. p. 237, Syst. Eleuth. Type locality "Carolina."
Cicindela ventralis Newman, 1818. p. 413-414. Type locality "St. John's Bluff, East Florida, North America."
Cicindela abdominalis faceta Casey, 1913. p. 38. NEW SYNONYMY. (No locality, single female) Type USNM 45969 red label.

Size: Females average 11.0 mm. (10.3 - 12.5); males average 10.0 mm (9.3 - 10.5).

Head: Eyes prominent, approximately as wide as humerus, distinctly wider than pronotum; black, with purple, green, and blue reflections, microsculpture isodiametric. Labrum pale, with 2 anterior medial setae and 2 lateral setae; edentate, lateral area microsculpture isodiametric, stretched medially. Mandibles pale basally, apical half piceous with metallic reflection. Ligula lacking. Mentum with single acute median tooth. Maxilla with cardo 2-3 setae, stipes with 3-4 setae, segment 1 with single erect seta, segment 2 glabrous, segment 3 with 2-3 setae, segment 4 with 2 apical setae, segment 5 glabrous. Labial palp 4 segmented; segments 1-2 pale rufous, glabrous, segment 3 rufous with 20 erect setae, segment 4 piceous and glabrous. Gena glabrous, shallowly grooved. Frons longitudinally strigose, strigae isodiametric. Inner margin of eye emarginate; 2 erect supraorbital setae. Antennal segments 1-4 glabrous except for isolated large erect setae. Segment 1 with 1 erect apical seta, rufopiceous ventrally. Segment 2 lacks tactile setae. Segment 3 with 3-4 basal setae, 1-2 medial setae, 5 apical setae. Segment 4 glabrous basally, 5-7 apical setae. Segments 1-4 with metallic green reflections. Segments 5-11 densely covered with short pubescence. Segment 5 rufopiceous, 6-11 piceous. Segment 1 swollen apically, 3 times as long as segment 2, one half as long as segments 3 and 4; segments 3 and 4 subequal, elongate.

Thorax: Pronotum dorsally with deep anterior v-shaped impression, longitudinal median line moderately impressed with transverse strigae extending laterally. Microsculpture coarse, isodiametric. Basal impression moderately impressed, posterior lateral angle suggested by an elevated bump. Surface with cupreous (blue-green) reflection. Lateral margin with inconspicous fringe of white hairs which, when missing, are indicated by extremely fine punctures near

marginal groove. Prosternum glabrous, microsculpture effaced, with purple reflection. Proepisternum with approximately 15 white setae along basal margin adjacent to procoxae, otherwise glabrous. Microsculpture effaced, shiny. Procoxae with anterior surface with fringe of white hairs, inner surface glabrous. A single erect seta on inner medial surface. Trochanter glabrous, pale rufous. Profemur with metallic blue-green reflection; piceous basally, rufous apically, knees with metallic green reflection. Ventrally with 2-3 erect setae. Numerous large erect setae on anterior and inner surface. Isodiametric microsculpture evident over entire surface. Protibia ventral inner surface with fringe of hair, dorsal surface glabrous except for scattered tactile setae. Tibia with metallic green reflection. Tibia with 2 large ventral apical spines.

Protarsi of male ventrally with segments 1-3 with dense covering of hairs, segments 4-5 glabrous except for a few erect setae. Females with tarsal segments unmodified. Each tarsal segment (both sexes) with 2 ventral apical spines, claws smooth, subequal. Mesosternum smooth, glabrous. Mesepisternum glabrous medially, basally with fringe of white decumbent setae. Mesocoxae as in procoxae. Mesotrochanter glabrous, tibia and tarsi as above. (Posterior surface of coxa with basal setae.) Mesofemur with 1-2 ventrally erect setae on apical half. Mesepimeron with covering of decumbent white hairs. Metasternum glabrous medially, extreme anterior margin with up to 8 white setae; anterior lateral angle labrous; posterior lateral margin with fringe of setae. Metepimeron covered with whte decumbent setae. Metacoxal process with single large erect tactile seta basally and apically, also with lateral fringe of white setae. Metafemur with 2-4 ventral erect setae.

Abdomen: Rufous, sternites 1-4 with decreasing lateral fringe of white setae. Segment 3 laterally overlapping segment 4 in the form of a flange, extending posteriorly to segment 5. Segments 3-5 medially with several inconspicous setae. Segment 5 emarginate apically in male, depressed and setose in female. Segment 6 in male with apical fringe of setae. Elytra black, with apical lunule and other maculation white. Median lunule represented by broken dots or lunule may be totally absent. Scutellum with cupreous to blue-green reflection; microsculpture coarse, isodiametric. Basal elytral punctures at scutellum umbilicate. Elytra with row of 6-9 large foveae, each with metallic blue-green reflection and containing a single umbilicate setiferous puncture. Elytra irregularly and shallowly punctured (Fig. 2), microsculpture isodiametric, granular. Subsutural row of metallic punctures shallow, with blue-green reflection. Apex of elytra spined and microserrulate in both sexes. Humeri with impressed groove containing 5-6 umbiliferous punctures. Male genitalia (Fig. 5).

Distribution: New Jersey, south along the Atlantic seaboard to north central Florida, west along the Gulf States to Louisiana.

Variation: Elytral pattern appears to be more heavily maculated in northern specimens, decreasing southward. This probably led to the naming of Casey's *Cicindela faceta.*

Cicindela scabrosa Schaupp NEW STATUS

Cicindela abdominalis var. *scabrosa* Schaupp 1884, p. 108. type locality FLA (Cedar Keys).

Cicindela extenuata Casey 1913, p. 38. Type locality Crescent City. Holotype USNM Type 45970 red label.

Paratype USNM Type 45970 "extenuata 2," red label.

C. abdominalis floridana Cartwright 1939, p. 364. Type locality Miami, FL., Collr. F.N. Young, Aug. 9-12, 1934, NEW SYNONYMY.

Size: Females average 10.5 mm. (10.0 - 11.5), males average 9.8 mm. (8.2 - 10.3).

Head: Eyes prominent, as wide as humerus, wider than pronotum. Clypeus black with green central area, purple laterally. Microsculpture isodiametric. Labrum pale, with 4 medial

setae, 2 lateral. Mandibles piceous with narrow pale basal lateral portion. Mentum with acute median tooth. Ligula lacking. Maxilla cardo with 3 white setae, stipes with 4-5 setae. Segment 1 with 1 apical seta, segment 2 glabrous, segment 3 with 3 setae ventrally, segment 4 with 1 ventral seta (apex), segment 5 glabrous. Labial palpi 4 segmented, segments 1 and 2 glabrous, segment 3 with approximately 20 erect setae on dorsal surface, segment 4 glabrous. Colored as in *abdominalis* and *highlandensis*. Gena glabrous with purple reflection, 3-5 grooves terminating anteriorly in a depressed pit. Frons glabrous with suggestion of striae laterally, central area smooth and elevated. Eyes with 2 erect supraorbital setae. Antennal segments 1-4 glabrous with metallic reflection, 1-2 erect setae on each segment. Segments 5-11 covered with dense tomentose setae. Segment 1 with 1 large erect seta; segment 2 glabrous. Segment 3 with 3-5 medial setae, 6 apical setae. Segment 4 with 1-2 medial setae, 3-5 apical setae. Segment 1 gradually swollen apically, 2 times the length of segment 2. Segment 3 less than 2 and 4, greater in length than 1 and 2. Segment 4 shorter than 3.

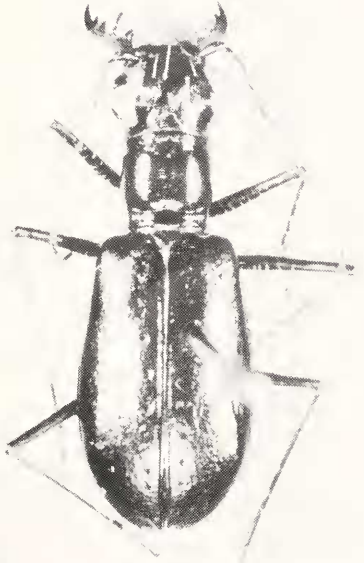
Thorax: Pronotum with anterior v-shaped impression; middle smooth, microsculpture reduced, basal impression shallow. Lateral margin with 30 - 50 flattened setae. Prosternum glabrous, with greenish reflection, shiny. Proepisternum with numerous white setae near procoxae, the remainder smooth, shiny, microsculpture effaced. Procoxae anterior surface with dense layer of flattened setae. Single erect slender seta on inner surface. Trochanter glabrous. Profemur with 6-7 ventral erect setae. Protibia anterior surface with 6-7 short, erect seta in depressions. Inner half surface apically with dense layer of fine setae. Protarsi glabrous dorsally, ventrally with 4 pair of small erect setae and 1 large apical pair. Segment 1 longest, 2-5 subequal. Males with segments 1-3 ventrally with dense layer of hair; female unmodified; 2 tarsal claws, long smooth, subequal. Meso-sternum glabrous, smooth, shiny. Mesepimeron covered with dense fringe of decumbent setae. Mesocoxae anterior surface with numerous white setae, posteriorly with single large erect seta. Trochanter glabrous. Mesofemur with 5-6 erect setae on ventral surface. Mesotibia with dense fringe of short setae near apex on inner surface. Mesosternum with scattered decumbent setae on anterior margin. Metepisternum and metepimeron with dense covering of decumbent setae. Metacoxae with fringe of setae along posterior margin, also with 2 erect setae. Metatrochanter glabrous. Metatibia glabrous apically except for short scattered erect setae. Ventral surface with row of 11-12 erect setae on posterior and anterior margin.

Abdomen rufous. Sternites 1-3 with dense lateral margin of decumbent setae. Sternites 3-5 with 2 central erect tactile setae. Sternite 6 with deep median depression in females, covered with short erect pubescence. Males with sternite 6 moderately emarginate, not depressed. Elytra shiny black, often with greenish luster around humerus (extreme form of greenish cast seen in *C. abdominalis floridana*, but also seen to greater or lesser degree from different localities). Maculation consisting of apical lunules, median lateral mark, and 2 small medial dots slightly anterior to mid-lateral dots. Few specimens lacked the mid-lateral maculation missing in the majority of specimens of *C. abdominalis*. Elytral apices spined in both sexes. Microsculpture largely effaced, finely isodiametric, lending a shiny appearance to the beetles. Microsculpture of type entirely unlike *abdominalis*. Elytral tips microserrulate; surface heavily and deeply punctured throughout (Fig. 3), punctures often separated by less than their own diameter. Large sutural foveae with umbiliferous center.

Genitalia, male: Fig. 6.

Distribution: Restricted to peninsular Florida, in sand-pinescrub and along margins of pine flatwoods.

Variation: This species exhibits little variation. Some specimens are quite greenish (i.e., *floridana*) but this is interpreted to be a sign of recent emergence. Older specimens appear to have lost the greenish tint. Maculation (Fig. 3) is quite constant.



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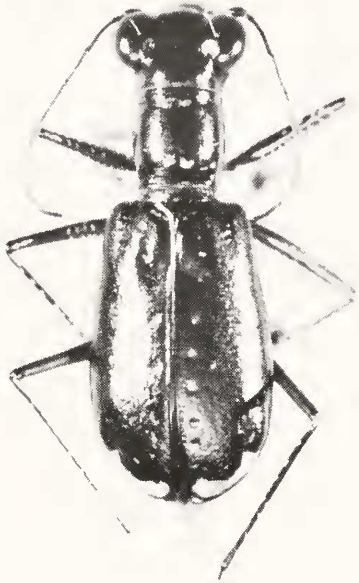

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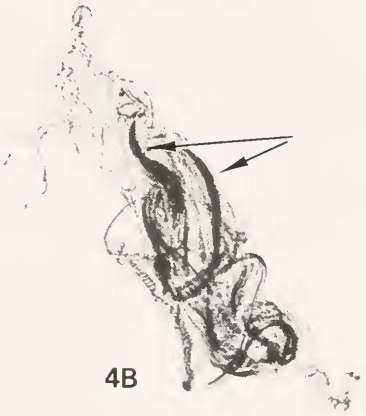
Fig. 1. ***Cicindela highlandensis*** n. sp., holotype female. Actual size 11.5 mm. Fig. 2. ***C. abdominalis*** Fabricius. Actual size 10.2 mm. Fig. 3. ***C. scabrosa*** Schaupp. Actual size 10.5 mm.

4A



4B

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Fig. 4A. *C. highlandensis* n. sp., paratype, aedeagus. Internal sac removed. Fig. 4B. Internal sac, same specimen, removed to show internal sclerites characteristic of *Cicindelidia* Rivalier. Fig. 5. *C. abdominalis* Fab., aedeagus. Fig. 6. *C. scabrosa* Schaupp, aedeagus. Figs. 4, 5 and 6 are printed at the same magnification to show relative size.

DISCUSSION

Cicindela highlandensis n. sp. (Fig. 1) belongs in the subgenus *Cicindelidia* (*sensu* Rivalier's genus *Cicindelidia)* as illustrated by its red abdomen and male genitalia (Fig. 4). It differs from *C. abdominalis* Fab. (Fig. 2) by its total lack of decumbent setae ventrally, by the lack of pronotal hairs, and by reduced maculation. The male aedeagus is more robust than that of *abdominalis* (Fig. 4 vs. Fig. 5).

C. highlandensis will key to couplet 4 in Willis's (1968) key to the North American species of *Cicindela.* This should be modified as follows:

4a. Labrum with 2 anterior medial setae, 2 lateral setae.
  4a'. Ventrally glabrous; lacking pronotal hairs ..... *C. highlandensis* n. sp.
  4a.'! Ventrally with lateral sclerites covered with decumbent setae, also sternites 1-4 with lateral decumbent setae; pronotum with at least a few lateral setae, or if absent, punctures are visible along suture..... C. *abdominalis* Fabricius
4b. Labrum with 4 anterior medial setae, 2 lateral setae..... 5
5a. Elytra deeply punctured, scabrous; surface shiny (Fig. 3).... *C. scabrosa* Schaupp
5b. Elytra shallowly punctate or impuncate..... 6
6a. Elytra shallow punctate
  6a'. Proepisternum densely setose ..... *C. roseiventris* Chev.
  6a'! Proepisternum with sparse setae near coxal margin..... *C. politula* LeConte
6b. Elytra impunctate 7

Cicindela scabrosa will key to the species with 4 anterior medial setae on the labrum. From *abdominalis* and *highlandensis, scabrosa* may easily be separated by habitus (Fig. 3) and by male genitalia (Fig. 6). Both *abdominalis* and *highlandensis* have 2 medial setae on the labrum.

The most striking differences between *scabrosa* and the other two species are densely punctate elytral surface in *scabrosa* only; conspicuous lateral row of pronotal hairs in *scabrosa* 30-50 per side, 0-15 in *abdominalis.* 0 in *highlandensis;* extensive covering of decumbent setae ventrally in *scabrosa,* while in *abdominalis* is reduced, and *highlandensis* is glabrous.

Cicindela highlandensis n. sp. has been collected only in Highlands Co., Florida, near Sebring. This is an area of high endemism in many groups of plants and animals. Species restricted to this area include spiders (Brady 1972, McCrone 1963, McCrone & Levi 1964), lizards (Carr 1940), camel crickets (Hubbell 1960), millipedes (Keeton 1959), and mutillid wasps (Schmidt & Mickel 1979). The sand dunes near Sebring are considered the southernmost extension of the Lake Wales Ridge (Laessle 1958). Typical scrub as well as sandhill vegetation occupy much of this area, and some of the highest elevations in peninsular Florida are found here. *Cicindela scutellaris unicolor* and *C. hirtilabris* LeConte which would normally occur in this habitat, are absent. Larvae of *C. highlandensis* have not yet been collected, and adult activity probably occurs only in the summer

7

8

Fig. 7. Type locality of *C. highlandensis* n. sp.. Fig. 8. New citrus grove near type locality of *C. highlandensis* n. sp..

months as in *C. abdominalis* Fab..

The range of *C. highlandensis* is apparently restricted to fossil sand ridges. Unfortunately, these sand ridges are rapidly being converted into citrus groves (Figs. 7 & 8). Unless some means of preserving this habitat is found, numerous organisms will become extinct, including this species.

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